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General Notes.

GEOGRAPHY AND TRAVELS.

Mexico.—In a communication made to the Academy of Natural Sciences of Philadelphia, at a recent meeting, Professor Heilprin placed on record his barometric determinations of the heights of the four loftiest summits of the Mexican Republic,—Orizaba, Popocatepetl, Ixtaccihuatl, and the Nevado de Toluca. From these it would appear that considerable corrections will have to be made in geographies of the recorded heights of these far-famed giants of the South. All the observations were made by means of a carefully tested aneroid barometer, and the data computed from almost simultaneous observations made at the Mexican Central Observatory of the City of Mexico, and from barometric readings made at the sea level at Vera Cruz. The equable condition of the atmosphere at the time these observations were made rendered the possibility of the occurrence of possible errors of magnitude almost *nil*.

HEIGHT OF POPOCATEPETL.—The height of Popocatepetl, commonly accepted as the highest peak, was recorded by Alexander von Humboldt in 1804 as 17,720 feet. Several measurements have been made since the date of the trigonometrical observations of the distinguished German traveler, and with results varying from 17,200 feet to somewhat over 18,000 feet. Professor Heilprin's measurements give 17,523 feet, or 200 feet less than the estimate of Humboldt, as corrected by his astronomical associate, Oltmanns. The significant fact, however, pointed out, that while geographers have almost universally accepted Humboldt's determinations and figures, they have neglected to take account of the newer data which have been made possible through the leveling of the Mexican Railway, which was constructed a few years since. These show that the estimate of the elevation of the City of Mexico (7,470 feet) and of the adjoining plateaus, which have served as a basis for most of the angle measurements of the mountains, have been placed 123 feet too high. Allowing for this excess, a striking correspondence is established between the early measurements and those obtained in the spring of the year by the Philadelphia expedition.

The ascent of the peak was made on the 16th and 17th of April by Professor Heilprin and Mr. F. C. Baker, the rim of the crater being reached at 11.30 o'clock on the morning of the 17th, and the culminating point early in the afternoon of the same day. Little difficulty was encountered in the ascent beyond that which is due to the inconvenience arising from the highly rarified atmosphere. The snow field was found to be of limited extent, and not more than from five to ten feet in depth, and was virtually absent from the apex of the mountain. The surprisingly mild temperature of the summit, 45 degrees Fahrenheit, rendered a stay of several hours in cloudland very delightful.

THE MOUNTAIN OF ORIZABA.—With regard to the elevation of what is commonly supposed to be the second highest summit of the Mexican Republic, the peak of Citlaltepétl or Orizaba, the results of Professor Heilprin's determinations show more marked variations from those of most of the earlier investigators, and more particularly from those of Humboldt. The latter determined the height of the mountain, by means of angles taken from near the town of Jalapa, to be 17,375 feet, while a still earlier determination by Ferrer, in 1796, and recorded in the transactions of the American Philosophical Society, gave 17,879 feet. The latter estimate has been generally adopted by German geographers, and Humboldt himself has considered it more nearly representing the truth than his own measurement. The Mexican geographers, on the other hand, have adopted the measurement of Humboldt, or that which was obtained by the National Commissions of 1877, and which indicated a height of 17,664 feet.

Professor Heilprin, with three of his scientific associates and eleven guides, made the ascent of the mountain on the 6th and 7th of April, or ten days before the ascent of Popocatepétl. The last camp, at a height of some 13,000 feet, was left shortly before five o'clock in the morning of the second day, and after a difficult and continuous struggle of twelve hours through loose boulders, sand, and a much cut-up ice cap, the party—or rather the fragment which succeeded in holding out—finally reached the rim of the crater.

A photograph was here obtained of the depression which marks the summit of this most symmetrical cone of the North American continent. Professor Heilprin's measurement, which was made at a point about 120 feet below the apex of the cone, indicates a total height of the mountain of 18,206 feet, or some 325 feet in excess of the measurement of Ferrer, and upwards of 800 more than that of Humboldt.

The equal conditions of the atmosphere under which the measurements of both the peaks of Orizaba and Popocatepétl were made, and

the fact that the two measurements were made with the same instruments, after an interval of only ten days, appear to leave but little room for doubt that the latter determination is within close limits the correct one. There thus seems no question but that the first place among Mexican volcanoes must be accorded to the "Star Mountain."

The sense of excessive fatigue which marked the ascent of this mountain as compared with that of Popocatepetl was considered in itself a sufficient index of the much greater elevation. Messrs. Witmer Stone and F. C. Baker, two of Professor Heilprin's associates, were compelled to desist from the final attack upon the mountain when not more than some 300 feet below the summit. Mr. Le Boutillier's strength failed him at an elevation of about 14,000 feet.

As upon Popocatepetl, the snow cap upon Orizaba, although arising 2,400 feet, or nearly half a mile, above the summit of the highest peak of the Alps, was a comparatively insignificant development. Only a quarter of an hour was passed on the crest of the mountain when the difficult descent through the numerous *seracs* of the ice was made. The camp was reached at a little after eight o'clock in the evening, thus completing a remarkable round of mountain-climbing of fifteen successive hours.

The views from the slopes of the mountain are described as being surpassingly grand, far exceeding anything that Professor Heilprin had hitherto seen in his travels. Far off to the west the giants Popocatepetl and Ixtaccihuatl were clearly outlined against the sky at a distance of about 100 miles, while to the east and south the eye wandered over a seemingly endless expanse of plateaus and lowlands, penetrating through a series of successive cloud-planes.

ASCENT OF IXTACCIHUATL.—The ascent of the third highest peak of the Republic, Ixtaccihuatl, was made on the 27th of the same month on which the two other ascents above noted were also made. In its general features, this mountain differs broadly from the two peaks before mentioned. Although the remains of a volcano, it no longer presents either the symmetry or conical outline of its more famous rivals. A strong, flowing crest, covered with a heavy deposit, some 75 or 100 feet in thickness, of snow and ice, serves readily to distinguish the familiar "White Woman" of the plain of Auahuac.

Above what is now the highest point there at one time arose the crater wall, but the destruction through natural causes of the summit has completely obliterated all traces of both the crater and wall. The heavy cap of snow, a true *firm*, or *nèvé*, feeds one or more glaciers which descend the western slopes. Across one of these glacial ice

sheets, whose nature was now for the first time made known to the Mexicans, the dangerous ascent was accomplished. Huge crevasses at short intervals barred the progress of the march, but the point, estimated to be about 75 yards below the summit, was reached about 10.30 o'clock in the morning. Two impassable crevasses, cutting the crest of the mountain at right angles, prevented a nearer approach to the apex.

Professor Heilprin's measurements determined the height of this mountain to be 16,962 feet, or from 800 to 1,300 feet above that which is accorded to it by Mexican geographers. This determination, on the other hand, accords very closely (within 11 feet) with the very careful, but now generally overlooked, trigonometrical measurements made in 1857 by Sonntag, under the auspices of Baron von Müller.

It is difficult to account for the low value of the height of this mountain given by Humboldt and the Mexican geographers, in view of its close proximity to Popocatepetl. So nearly do they appear of equal height that the eye at first fails to distinguish which of the two summits is the highest. German geographers, however, in a few cases, have adopted Sonntag's measurements, neglecting, however, as in the cases of Popocatepetl, to make allowances for the error, in this case of 125 feet, which is indicated by the leveling of the Mexican Railway.

The temperature on the summit of Ixtaccihuatl was found to be much lower than on either of the other peaks, being 32 degrees Fahrenheit.

ASCENT OF NEVADA DE TOLUCA.—The fourth highest summit of the Republic, the Nevado de Toluca, was ascended by Professor Heilprin and Mr. Baker on the 25th of April. This mountain, owing to its lesser elevation, has a much easier ascent than the others. In fact, it can be ascended by horseback to within about 600 feet of the apex. The rim of the broken crater is extremely ragged and narrow, descending with almost equal abruptness to the inner and outer faces of the volcano. At some points the crest is so attenuated that it can be readily straddled. This feature recalls the famous *Polnischer Kamm* of the Carpathian Mountains, which Professor Heilprin ascended in 1878, and from which there is obtained a precipitous descent on the one side into Galicia, and on the other into Hungary.

The barometric determination of the Nevada de Toluca gave a height of 14,952 feet, and gave approximately the mean between the determination of Humboldt and those of a class of students from the School of Engineers of the city of Toluca.

In regard to the position which the peak of Orizaba holds to the mountains of the North American continent generally, it may be said that its only rival without the Mexican domain is Mount St. Elias, situated on approximately the 141st parallel of latitude, and whose summit is claimed both by Great Britain and the United States (Alaska) as their possession.

So broadly divergent, however, are the results of the measurements of this mountain that as yet it has been impossible to obtain even remote concurrence in the views of geographers. Thus the early measurements of La-Pèrouse, made in 1786, give less than 13,000 feet. The British Hydrographic Chart of 1872, with its data borrowed from still earlier charts, gives 14,970 feet, and this estimate is the one which is generally followed by the English and a number of American geographers. Malespina in 1791 determined the height by means of angles, taken from near the position of Fort Mulgrave, to be 17,851 feet, which figure is reduced by Tebenkoff by somewhat more than 900 feet.

The most recent carefully conducted series of measurements are those which were made by Mr. W. H. Dall, under the auspices of the United States Coast Survey, in 1874. These yielded results ranging from a little more than 18,000 to nearly 20,000 feet. The measurements were made from distances of 69, 127, 167 miles, and it is more than likely that the discrepancy in the results obtained is due to the very small angles of measurements, and to an uncertainty regarding the actual position of the mountain.

The extreme variation of nearly 2,000 feet in a mountain less than four miles in height renders the correctness of the determinations extremely doubtful. With little doubt Mount St. Elias is considerably more elevated than appears on many of the English and German maps (14,975 feet), but in how near it approaches the height of the Mexican volcanoes is still a question for future solution. The existing evidence seems to point to the "Star Mountain" of Mexico, the peak of Orizaba, with its 18,200 feet, as the culminating point of the North American continent.—*Philadelphia Ledger*.